With regard to the Miocene fossils, especially the Cetacean vertebræ, settled into the broken surface of the Greensand, I did not enter into detail as to a wider distribution of these remains. It was not necessary for me to open out another series of observations beyond my immediate purpose. Let it suffice to say, however, that these remains are not confined to the surface of the Greensand, but that other specimens of the same were found by my own efforts at various points beyond this section of the bluffs.

I cannot admit that "each season presents new phases and unsettled local stratigraphic complications" in more than a superficial sense. The body of the promontory is not broken up, although every storm does abstract from or disturb a part of its face. Photographs in my possession show various changes which have been made from time to time in the ends and sides of the beds there exposed, but not a dislocation of the main body of the ridge. They confirm also the observation that several buttresses of the "Raritan" resting upon the lead-colored clay extend outward in original order from the ridge, while the intervening ones flanking the gullies are built of overthrown strata.

The so-called faulting is of a type common to clayey and sandy terranes, such as we are familiar with in the tide-water region of Maryland, where atmospheric agents, especially frost and thawing, open cracks somewhat parallel to the brow of a bluff. These cracks gape wider and extend deeper as the power of the sun increases, and at length cause a down-slide or fall when the beds become weakened by saturation with rain-water. Such fissures are also opened more widely and deeply by the dropping into them of coarse sand and pebbles, which spread apart by freezing and thawing. A notable example of this kind occurred to my observation on the projection of a heavy body of massive granite on Jones's branch, near Baltimore, where a fissure caused by freezing and thawing was gradually opened by an influx of sand, but which burst apart with almost explosive force one afternoon in the spring, following a season when numerous quartz pebbles had fallen into the crack from the overlying soil. The same phenomenon may be seen in the broken masses of granite which occur in places along the shores of Fisher's Island, near New London, Conn.

Several years ago, when many of the trees had been cleared from the brow of the cliffs of Potomac clay, along the shores of the Patapsco River, fissuring took place at intervals near the borders of these hills, and downthrows from the front of the bluffs were of common occurrence. In connection with such movements, and especially following a season of heavy autumnal rains, large cavities were rent in the cracking clays, some of which were large enough to admit a moderately large boy.

An example of the Gay-Head type of slipping, crushing, and swelling out, on a somewhat smaller scale, may be seen adjoining Sullivan's Cove, at the north-western end of Round Bay, Severn River, Md., and several of the same features, on a grand scale, may be studied next the face of Maulden's ridge, on the North-east River, Md.

The type of cutting and downthrow of the bluffs on the Vineyard Sound side of Gay Head is far more complex and varied than that of the south-west, or Atlantic, side. On the former the diagonal stroke of a surf from the south-east would cut deeper than the straight forward blow of the Atlantic on the south shore, and accordingly would be more effective in undermining the face of the terrane. The effects of those two methods of erosion are well shown on the opposite sides of this coast.

With regard to the aggregation of the non-marine lower portion of this series of formations, it seems probable that they were begun in the rocky hollows along the whole Atlantic coast from Maine to Cape Hatteras; that rapid currents carried large accumulations of broken stone and the elements of the crystalline rocks many miles out into a shallow sea, which was later barred out by the thick accumulations of these deposits, that thus a series of almost closed sounds was connected with the border of the continent, and that these sounds, extending in a sinuous north-east line, were the places of deposition of all the beds and strata which we now recognize as the Potomac, Albirupean, and the Raritan formations.

It has been my pleasure to read carefully both of Professor Shaler's accounts of Gay Head, and to recognize the many good statements that he has made regarding particular features of the region; but I fail to see that he has given an adequate account of the real structure of the promontory, of its relations to other parts of the island, or of its relations to the similar deposits in Massachusetts, Rhode Island, and Long Island. P. R. UHLER.

Baltimore, Md., Dec. 19.

The Reticulated Structure of Protoplasm.

AFTER I had read the proof of the article on the reticulated structure of human red blood-corpuscles published in *Science* for Sept. 16, 1892, I received a book recently issued in Paris, and entitled "La Cellule Animale, sa Structure et sa Vie, Étude Biologique et Practique, par Joannes Chatin, Professeur adjoint à la Faculté des Sciences de Paris, Chargé du Cours d'Histologie à la Sorbonne, Membre de l'Académie de Médicine." In this delightful treatise, which brings the knowledge of the animal cell to the present time, there are one or two statements in regard to the structure of protoplasm which I should have liked to quote in the paper mentioned, but as that is now impossible, I have asked the editor kindly to allow me to call attention to the following: —

C'est seulement en 1880, à la suite des recherches de Heitzmann, de Fromann et surtout des publications de Hanstein, que l'on commence à modifier la conception générale du protoplasma, pour le considerer, non plus comme une masse indifférente, mais comme une substance structurée.

Cette interprétation recontra une assez vive opposition. Il est des esprits scientifiques qui tiennent à demeurer constamment fidèles aux principes dont ils se sont inspirés dès leurs premières études et qu'ils ne consentent que difficilement à abandonner. . . .

On doit distinguer dans le protoplasma deux parties: l'*hyaloplasma* et le *paraplasma* (Fig. 49).

L'hyaloplasma est une substance fibrillaire, hyaline, réfringente, formant un réseau au milieu d'une substance fluide, moins réfringente, qui est le paraplasma. Qu'on se représente une éponge a travées très tenues et contractiles, plongée dans une substance visqueuse et granulée qui remplirait ses cavités. Cette comparaison donne une idée grossière, mais assez exacte, de la masse protoplasmique prise dans son ensemble.

Elle paraît homogène si les mailles de l'hyaloplasma sont uniformes et qu'on fasse usage d'un faible grossissement. C'est ainsi que le protoplasma avait été étudié durant longtemps, et l'on s'explique d'autant mieux l'erreur dans laquelle on demeurait à l'égard de ses parties constitutives, qu'elles ne se distinguent en général qu'après l'intervention de certains réactifs comme l'acide osmique. Cependent l'histologie zoölogique permet de les observer directement, et j'ai deja eu l'occasion de mentionner à cet égard l'exemple des cellules glandulaires de la Testacelle.

La structure réticulée du protoplasma s'observe dans les cellules amiboïdes comme dans les éléments à forme définie; l'étude des globules sanguins des Invertébrés (Vers, Crustacés, etc.), permet de constater aisément ce fait, d'abord révoqué en doute par des observateurs qui limitaient leurs recherches aux éléments de quelquels animaux supérieurs. ALFRED C. STOKES.

Trenton, New Jersey.

Auroral Displays.

IN answer to Professor Swift's inquiry in *Science* of Dec. 9, I will say that I saw "that memorable spectacle" in the winter of 1834 or 5 when "the snow and the sky suddenly assumed," in the evening, "a bright crimson red." It is one of the most distinct things in my remembrance. I was then well along in my "teens," but had not then undertaken very extensive meteorologic observations and records.

When Dr. Swift speaks of the aurora of July 16 last as "the grandest auroral display of the century," does he take into account the great aurora of August, perhaps, in 1859, when the whole sky was covered with beautifully colored streamers? A fine corona appeared, the display lasted from evening until morning twilight, was repeated less brilliantly during the following night, and with intermediate disturbances of the telegraph lines and of the mag-

netic instruments through the day. This great magnetic storm exhibited, if I am not mistaken, its phenomena in the southern, in the northern, in the eastern, as well as in the western, hemispheres. I watched the display for most of the two nights at West Springfield, Mass., and read many notices of it in the public prints.

I will add that at 10.45 P.M., Dec. 5, 1892, I saw, to me, an unique phenomenon. The moon was shining brightly, when diverging bands from the horizon in the north-north-west spread at the zenith 60° wide and converged again at the horizon in the south-south-east. They were like thin clouds, through which the stars were easily seen. The belt of Orion was exactly then in their midst. I can liken their shapes to nothing more than the vibrations of a cord, stretched from horizon, over the zenith, to horizon again. But they were stationary, and had so far disappeared at 11.30 P.M., standard time, that only curious traces and patches remained. I fancy that had not the moon been shining, these beautiful bands would have shown luminosity.

I judged that the radiating point in the north-north-west was a trifle west of the magnetic meridian there; but our western declination here is some nine degrees. These were, of course, parallel bands, the divergence and convergence points being the effect of perspective. JAMES HYATT.

Honeymeadbrook Station, N.Y., Dec. 19.

Alleged Extinction of Mulatto.

A FEW months since an article appeared in a medical journal affirming that the *pure mulatto* colonies of southern Ohio were dying out after the fourth generation. Can any reader point me to the article in question, or to any *definite* information bearing on the permanence of the mulatto as a species (or variety)?

Polytechnic Society, Louisville, Ky. JAS. LEWIS HOWE.

BOOK-REVIEWS.

Lessons in Elementary Mechanics. By Sir PHILIP MAGNUS. New York, Longmans, Green, & Co, 1892. 370 p. 12°.

Elementary Manual of Applied Mechanics. By ANDREW JAMIESON. London, Griffin & Co. 265 p. 12°. $1.25.

THESE two little treatises on mechanics illustrate two very distinct lines of college and school work, and are each characteristic of its class. Sir Philip Magnus has been distinguished for many years for his success as an author in this field, and his "lessons" have gone to their thirtieth thousand. The method of treatment of the subject is that which has been endorsed by authority and become "standard." The usual division of the subject into kinematics and dynamics is observed; and the latter is again subdivided, as customary, into kinetics and statics. Motion, as a more elementary idea than force, is first discussed, then follows the study of force and its effects in the production of equilibrium. The study of kinetics and of statics brings out the differences in effect when the body is free to move and when the forces produce no motion. The special feature of the book is the admirable manner in which energy is discussed and its operation illustrated. The extent of the work is such as is expected to suit the wants of the scholar of the first year, and is well adapted to the needs of those proposing to take the London University course or other of similar character. For this country it will make an excellent high-school course.

Professor Jamieson's work is characterized by its constant utilization of the principles taught, by application in the problems of every-day life and of constructive work. Even its illustrations have the advantage of being selected from among those of builders of machinery illustrating the principles treated. It is intended to meet the needs of students preparing for science and art examinations; but should be found of special value to those proposing to enter upon a course of technical education. It would be an admirable work for the better class of manual training schools, from which students pass into the technical colleges and professional schools of engineering. This establishment of a close relation between the principles taught and their useful applications in industry, and in the design and construction of machines, is a matter in which the older text-books have utterly failed, but in which the author uniting a knowledge of principles with familiarity with practice may always succeed, and with great advantage to himself in competition with the teachers of the abstractions alone. Even the average practitioner would be none the worse for a careful review of this little primer of mechanics.

The best of books have their little defects; and we observe, in both these primers of mechanics, the old, and long-ago exploded, ideas on friction; no distinction being made between the laws of solid and those of fluid friction and the "mediate" friction of lubricated surfaces. Here are the old laws and the actual fact in "parallel column": —

Laws of Friction.

Solid (Jamieson and others).	Fluid.	Mediate.
(1) F varies as Pressure.	F is constant with P varying.	F varies as $f(P)$.
(2) F independent of Areas.	F varies as A.	F varies as $f(A)$.
(3) F independent of Velocity.	F varies as V^2.	F varies as $f(V)$.

The first of these sets of "laws" is that usually found unqualified in elementary text-books and is, obviously, entirely misleading; although defective lubrication is so common in machinery that the result is less serious than might otherwise be the fact.

Geodesy (Riverside Science Series). By J. HOWARD GORE. Boston, Houghton, Mifflin & Co. 218 p. 16°. $1.25.

Introduction to Geodetic Surveying. By MANSFIELD MERRIMAN. New York, J. Wiley & Sons. 170p. 8°.

THE first of these books is an historical account of the science of geodesy from the time of the ancients to the present, written in popular and interesting style, and is likely to prove most acceptable to the average reader, not an expert, who may desire to know something of the methods which have been adopted in the determination of the dimensions of the earth and their results. Its author has enjoyed the rare privilege of working from the original documents, as he states in his preface, and his sketch thus comes as authoritative. He commences his task by reference to, and brief descriptions of, the primitive notions of the older peoples, and their rude attempts to measure the earth. When their comparative ignorance of the subject, and their lack of instruments of exact measurement are considered, their approximations to the actual value of these dimensions seem little less than marvellous. The Chaldeans not only knew the earth to be "round" but made the degree equal to 4,000 steps of a camel, and the circumference of the earth about 24,000 miles. The Greeks and Romans took this quantity to be 250,000 stadia; the Arabians found it to be between 56 and 57 miles, 71 of our miles, per degree. Fernel, a French geometer of about 1550, measured the degree, and made it about 69 miles. Snell, in 1615, made the first scientific measurement of importance, however, making the arc of a meridian 55,072 toises, which is about 2,000 toises short. The toise is 6.4 feet.

Picard, in 1670, made the degree 57,060 toises, and so nearly correctly as to give to Newton his famous proof of the extension of the gravitation of the earth to its satellite. Later work is familiar to all interested in the subject, and it is a pleasure to note that the U. S. Coast Survey has done its share. It is considered by Professor Gore that the computations of Professor Harkness, making the ellipticity of the earth 1:300.2, and the quadrant to measure 10,001,816 meters, will prove most exact, although those of Bessel and Clarke are now generally received.

Professor Merriman's work is a formal and scientific treatise on the work of geodetic surveying. It includes a number of lectures on the figure of the earth, prepared as introductory, and also a discussion of the "Method of Least Squares," written especially for surveyors and engineers, as well as for students. The third and concluding part contains a synopsis of the methods and computations of precise triangulation. The introductory portion gives a history of the development of modern methods and some interesting facts relative to the work of the older geometers and